

Durham Research Online

Deposited in DRO:

20 October 2017

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Li, Shenxue and Clark, Timothy and Sillince, John (2018) 'Constructing a strategy on the creation of core competencies for African companies.', *Technological forecasting and social change.*, 131 . 204–213.

Further information on publisher's website:

<https://doi.org/10.1016/j.techfore.2017.08.008>

Publisher's copyright statement:

© 2017 This manuscript version is made available under the CC-BY-NC-ND 4.0 license
<http://creativecommons.org/licenses/by-nc-nd/4.0/>

Additional information:

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

Constructing a strategy on the creation of core competencies for African companies

ABSTRACT

A growing number of studies on economic development have relied on the premise that international technology transfer provides a mechanism for developing competitive advantages for companies of developing countries, and Africa in particular. In this article, we focus on the explicit nature of technology transferable to LDCs to argue that conventional technology transfer alone cannot create core competencies for African companies that lead to the sustainable economic development of the continent. Drawing on insights from the resource-based view and the knowledge based perspective, we develop a conceptual framework for constructing core competencies for African companies. More specifically, we explore the under-researched linkage between core competencies and knowledge management. By examining the roots of core competency in the resource-based view and knowledge-based perspective, we identify the knowledge underpinning core competencies. We then reconcile diverse knowledge management models to propose an integrative approach towards generating such critical knowledge, based on which we further argue that African companies should build their strategy on the creation of core competencies rather than solely relying on conventional international technology transfer.

Keywords: international technology transfer, core competence, knowledge management, Africa

1. Introduction

International technology transfer (ITT), “the diffusion of technology from the place of its introduction to other markets around the world” (Grosse, 1996, p. 782), is increasingly viewed as a mechanism for developing competitive advantages for indigenous companies of developing countries (Buckley and Hashai, 2014; Chen, 1983; Contractor, 1980; Cusumano and Elenkov, 1994; Glass and Saggi, 1998; Keller, 2004; Osabutey and Debrah, 2012; Radosevic, 1999). For example, based on a longitudinal study of 29 manufacturing industries in Shenzhen special economic zone of China, Liu (2002) argues that ITT through foreign direct investment (FDI) has significantly improved and strengthened the competitiveness of Chinese manufacturing industries. In recent years, there is growing evidence to suggest that ITT creates important conditions for African firms in certain sectors to catch up with technologically advanced economies (Amankwah-Amoah, 2015; Amankwah-Amoah and Sarpong, 2016; Osabutey and Jin, 2016; Osabutey et al., 2014).

While ITT may have a crucial role to play in reducing the technological gap between companies of industrial economies and African firms, substantial challenges remain. Several scholars (Hill and Hay, 1993; Maskus, 2003; Radosevic, 1999; Westphal et al., 1985) have found that conventional ITT between technologically advanced economies and less developed countries (LDCs) is often limited to the transfer of technical information and equipment rather than technological know-how, a critical source of competitive advantage (Leonard and Sensiper, 1998; Nonaka, 1994; von Krogh et al., 2000) directly linked to core competency of the recipient (Prahalad and Hamel, 1990). A large number of studies (Aitken and Harrison, 1999; Archibugi and Pietrobelli, 2003; Borensztein, De Gregorio and Lee, 1998; Djankov and Hoekman, 2000; Keller, 2002; Kim, 1997; van Pottelsberghe de la Potterie and Lichtenberg, 2001; Xu, 2000) report that countries that are further from the global frontier often have limited

collective learning capabilities to absorb and integrate the transferred knowledge effectively into their production and development systems. Hence, conventional ITT between industrial economies and LDCs alone does not necessarily facilitate the development of technological core competence of the technology recipient (Amman and Cooper, 1982; Maskus, 2003). Yet it is unclear from the literature how technology recipient nations can overcome such challenges and develop their own core competencies needed for their indigenous companies to create a distinctive competitive edge in the knowledge-based economy.

In this paper, we focus on the explicit nature of technology transferable to less developed countries (LDCs) to argue that conventional ITT alone cannot create technological core competencies for African companies that lead to the sustainable economic development of the continent. Drawing on insights from the resource-based view and the knowledge based perspective, we develop a conceptual framework for constructing core competencies for African companies. To accomplish this goal, we explore the under-researched linkage between core competencies and knowledge management. By examining the concept of core competency, and its roots in the resource-based view and knowledge-based perspective, we identify the knowledge that underpins core competencies. We then propose a knowledge management model to suggest the strategic means with which African firms can generate such critical knowledge, based on which we pinpoint that African companies should build their strategy on the creation of core competencies rather than solely relying on conventional international technology transfer mechanisms.

The discussion of core competencies for African firms in this paper is structured around five propositions, each has associated with it a certain critical issue identified in the literature on ITT strategies for developing countries, the resource-based view and the knowledge-based perspective, areas which we intend to contribute to.

2. Knowledge and technology

Knowledge is so intrinsically ambiguous and equivocal a concept that no single commonly agreed definition for this intangible factor exists despite the plethora of attempts (Birkinshaw et al., 2002; Grant, 1996; Phelps et al., 2012). Building on Polanyi's (1958) original assumption that knowledge cannot be fully expressed, some scholars (Ambrosini and Bowman, 2001; Griffith et al., 2003; Leonard and Sensiper, 1998) proposed a continuum view of knowledge. In contrast to the widely employed tacit-explicit dichotomy view of knowledge which tends to polarize knowledge types, the continuum perspective of knowledge sees knowledge as existing on a spectrum, with tacit and explicit knowledge at the two ends. At one end of the spectrum knowledge is totally tacit and thus difficult to explicate. At the other end of the spectrum, knowledge is completely explicit and can be easily codified. Most forms of knowledge fall somewhere in between these two extremes. This paper adopts this wider view of knowledge, based on which we outline our understanding of technology below.

Technology generally refers to the application of knowledge to industrial or commercial use. Technology may be a set of pieces of knowledge embodied in particular products or tangible equipment, systems and devices used in productive activities (Blau et al., 1976; Dosi, 1982; Leonard-Barton, 1992; Woodward, 1958). It may also be disembodied knowledge consisting of particular expertise, production techniques, experience of past experiments, managerial methods, and know-how of complex business processes (Grosse, 1996; Perrow, 1967; Thompson, 1967). According to Grosse (1996), technology can be categorized as product technology (the knowledge used to specify the characteristics and uses of any product), process

technology (the knowledge used in any production process such as know-how of organizing the inputs), and management technology (the managerial skills used in operating a business).

For classical and neo-classical theorists of value and distribution (Arrow, 1962; Jewkes et al., 1958; Solow, 1957), technology is codified technical information and, therefore, easily reproducible and transferable (Radosevic, 1999). However, recent economic theorists (e.g. Mowery and Rosenberg, 1989; Patel and Pavitt, 1994) argue that technology is part of the firm's firm-specific assets cumulated over time. In this perspective, a significant part of technology is tacit knowledge deeply rooted in the firm's local context, and thus, difficult to reproduce and transfer (Dosi, 1982; Radosevic, 1999). Yet a number of scholars (e.g. March and Simon, 1958; Orlikowski, 1992; Romer, 1993) suggest that technical information and the more tacit forms of technical know-how coexist in firms because the application process of scientific knowledge produces context-specific idiosyncratic knowledge. In this paper, we see technology as knowledge existing on a spectrum, with explicit technical information and highly tacit technological know-how (i.e. context-specific specialized knowledge) at the two ends.

3. Knowledge underpinning core competencies

3.1. The concept of core competency

The concept of core competency has been interchangeably used with core capability, distinctive competency or distinctive capability by different researchers (e.g. Brown and Duguid, 1998; Day, 1994; Stalk et al., 1992; Meyer and Utterback, 1993; Prahalad and Hamel, 1990). With the emergence of resource-based view in the late 1980s and early 1990s it has been widely used to refer to those resources that are unique, inimitable and universally applied in different markets.

Prahalad and Hamel (1990, p. 82) defined core competencies as “the collective learning in the organization, especially how to co-ordinate diverse production skills and integrate multiple streams of technologies”. By quoting the example of Sony's miniaturization they further stated that “core competence is about harmonizing streams of technology, it is also about the organization of work and the delivery of value”. This definition parallels Stalk, Evans and Schulman's (1992, p. 62) view of distinctive capabilities. They attribute organizational success to a capability that is defined as “a set of business processes strategically understood”.

Similarly, by analyzing Wal-Mart's cross-docking logistic systems, Day (1994, p. 38) gave capabilities a more explicit meaning – “complex bundles of skills and collective learning exercises through organizational processes that ensure superior co-ordination of functional activities”. He characterized “distinctive capabilities” valuable to customers, matched by rivals and used in different ways to “speed the firms' adaptation to environmental change” (Day, 1994, p. 40). Collis and Montgomery (1995, p. 120) suggest that strategies should be built on “valuable resources” – “an organizational capability embedded in a company's routines, processes, and culture”. They emphasized the business context in which core competence is deployed.

Tampoe (1994) made the first effort to distinguish core competency and distinctive capability by emphasizing that the true competency of an organisation lies in its technical subsystem. However, this has been challenged by certain authors (e.g. Day, 1994; Marino, 1996; Stalk et al., 1992) in respect of its vulnerable nature amid environmental change.

Although capability-approach theorists have been trying to differentiate capabilities from competencies the dividing line between them is still unclear. Nevertheless, certain researchers (e.g. Day, 1994; Marino, 1996) have suggested that core competencies and core capabilities possess homogeneous characteristics and, thus, are equally important to the firm's business success. In this paper, core competencies will encompass both.

3.2. Core competencies in resource-based view

In the resource-based view, resources are classified as tangible and intangible. According to Grant (1991) tangible resources include financial resources and physical resources such as plant, equipment, and stocks of raw materials. Intangible resources range from intellectual property rights such as patents, trademarks and copyrights to the know-how of personnel, informal networks, organisational culture and a firm's reputation (Hall, 1992). However, the dividing line between the tangible and intangible is often unclear and how they are classified can vary from one writer to another. Nevertheless, agreement on the relative importance of the two types of resources has been achieved in spite of the problems over classification. Although it is clear that both types of resources are required for any business to operate, resource-based theorists argue that intangible resources are the most likely source of competitive advantage, because they are less visible and, therefore, more difficult to identify, understand and imitate (Hall, 1992). Consequently, the importance of intangible concepts, such as know-how (Teece, 2000), corporate culture (Barney, 1986) and reputation (Aaker, 1989), is widely recognized in work adopting the resource-based view. Whether or not these intangible resources have the potential to become core competencies depends on how difficult they are for competitors to acquire and how valuable they are to the firm as a basis for competitive advantage. As Day (1994, p. 41) states:

“when they are rare, difficult to imitate, non-substitutable and they allow a firm to exploit opportunities or neutralize threats, then they can be considered core competencies and serve as the basis of an organisation's sustained competitive advantage.”

Therefore, the concept of “core competency” was developed in the resource-based view to indicate the need for the resources that are unique, inimitable and universally applied in different markets, and to evaluate the firm's strategies. However, the questions raised thereafter are what resources meet these measures for core competencies and how core competencies could be developed. The search for the answers to these questions has led to widespread recognition of the importance of managing knowledge.

3.3. Core competencies in knowledge-based view

Knowledge has been increasingly recognized as a powerful source of competitive advantage. Not surprisingly, many of the perspectives that dominate current thinking concerning competitive advantage have focused on knowledge management as their strategic means for securing competitive advantage. The central argument in this research stream is that knowledge must be proactively managed to sustain core competencies (Boisot, 1995; March, 1991; Nonaka, 1994). Thus the concept of core competencies which evolved from the resource-based view has recently diffused into the field of knowledge management. However, the linkage between core competencies and knowledge management is under-researched. As Eisenhardt and Santos (2002) have argued, it is unclear from the literature what constitutes valuable knowledge that underpins core competencies. Consequently, it is unclear what knowledge management strategies position the firm at the competitive edge (Davenport and Prusak, 1998).

In the knowledge-based view, knowledge is conceived to be the most important intangible resource (e.g. Grant, 1996). Competencies or capabilities are viewed as “sets of knowledge that differentiate a company strategically” (Oliveira Jr. and Child, 1999, p. 4).

It is widely accepted that, unlike explicit knowledge, tacit knowledge (e.g. technological know-how) is difficult to capture and copy. Hence, it is a powerful source of competitive advantage (Boisot, 1995; Grant, 1996; Leonard and Sensiper, 1998; Nonaka, 1994; von Krogh et al., 2000) and, according to Prahalad and Hamel (1990), is directly linked to core competency. However, as tacit knowledge originates in people's heads there is a debate in the literature about whether tacit knowledge should or can be shared. Some commentators (Argyris, 1994; Decarolis and Deeds, 1999; Nonaka, 1994, Teece, 2000) express the view that knowledge is of no great value unless it is shared. They further claim that individual tacit knowledge is mobile, hence, needs to be transmitted into collective know-how. They argue that the core competency of the firm lies in its collective tacit knowledge. Others (e.g. Boisot, 1995) hold that diffused tacit knowledge tends to leak away and core competencies are not sustainable and become diluted.

Nevertheless, the latter view is criticized by a number of scholars (e.g. Oliveira Jr. and Child, 1999; Lei et al., 1996; Spender, 1998). For example, Oliveira Jr. and Child (1999) argue that the strategic problems will be of less intensity when the firm's advantage is based on collective knowledge such as a teamwork solution because it is embedded in the organization and difficult for competitors to imitate. They further state that collective know-how is more difficult to circulate and transfer, and the more it is embedded in the work practice, the less relevant is the absence of one or some of the members of this collective. Wal-Mart's success in its distinctive capabilities building adds effective evidence to this point (Stalk et al., 1992). Another example showing the strength of embedded knowledge comes from Toyota's higher quality products over GM's although they had the same standard system (Inkpen, 1998). Moreover, McEvily and Chakravarthy's (2002) research on knowledge attributes underpinning key capabilities provides further support to this point when they state that increased complexity of collective know-how ensures its competent nature. They argue that collective know-how is

complex in nature therefore generates durable advantages because such knowledge is difficult to imitate.

However, by looking at the specialized, context-specific, distributed and intrinsic nature of tacit knowledge some researchers (Almeida et al., 2002; Grant, 1996; von Hippel, 1994) question whether all types of personal tacit knowledge can be or are necessarily transmitted into collective know-how. Building upon this perspective certain scholars argue that integrated knowledge, created by combining many areas of specialized knowledge (e.g. highly tacit technological know-how), is sticky and so not easily diffused to rival organizations, and is, thus, the essence of organizational capabilities (Day, 1994; Foss and Knudsen, 1996; Kogut and Zander, 1992; Kotha et al., 2013; von Hippel, 1994). For example, when a management team utilize their individual specialized knowledge to make and implement consensus strategic decisions their knowledge will be integrated and difficult to diffuse, thus, of great strategic value at the organizational level (Gioia and Chittipeddi, 1991; Li et al., 2016; Majchrzak et al., 2012). A joint venture will be competitive when all its specialized knowledge from different parties is systematically woven together (Beamish, 1988; Madhok, 2006; Makino and Delios, 1996).

On the basis of this argument we propose that:

Proposition 1 (P1). Core competencies (or core capabilities) are the combination of collective tacit knowledge and integrated specialized knowledge.

In the context of ITT from technologically advanced economies to LDCs in Africa, this suggests that core competencies of technology recipients in African continent lie in their capabilities to develop and integrate collective and individual technological know-how.

Technology is seen as a fundamental competitive advantage of both domestic and international firms (Grosse, 1996). Our view of technology as knowledge ranging from technical information to context-specific technological know-how has important implications for understanding the nature of technology transferrable to LDCs. Conventional ITT between industrial economies and LDCs is carried out largely through FDIs in the form of equipment, subcontracting, and the transaction of import goods (and capital goods in particular) (Maskus, 2003; Radosevic, 1999). However, international trade in technology transfers information and equipment but not technological know-how that is firm-specific, yet, needed for recipient firms of LDCs to develop their own technological capabilities (Hill and Hay, 1993; Westphal et al., 1985).

Given the context-specific nature of technology, internationally transferred technology is often incomplete, and difficult to absorb without sufficient investment in learning and capability development in recipient countries (Grant and Gregory, 1997; Hobday, 1995; Rosenberg, 1982; Westphal et al., 1985). Such difficulties are compounded by the greater technology distance, the level of differences in economic, physical and social conditions, between the technology source of an industrial economy and the technology recipient of a LDC (Evenson and Westphal, 1995). Very often, conventional technology transfer to LDCs transmits codified proprietary information (e.g. written production processes, standards and operating manuals) that has been taken out of its local context and, thus, is largely explicit in nature. Such technical information does not constitute the recipient firm's core competencies (i.e. collective tacit knowledge and integrated specialized knowledge) identified above. Hence, technology transferable to LDCs in Africa is of limited value to recipient firms that hope to develop their own technological core competencies through ITT (Amman and Cooper, 1982). We therefore postulate that:

Proposition 2 (P2). Technology transferrable to LDCs is explicit in nature and, thus, does not constitute the recipient firm's core competencies (i.e. collective tacit knowledge and integrated specialized knowledge).

4. The creation of core competencies

The field of knowledge management strategy is arguably separated into two distinct domains – one in which it is maintained that knowledge should be transferred (Boisot, 1995; Nonaka, 2002; Senge, 1990; Szulanski, 1996), and a second domain wherein writers such as Demsetz (1991), Grant (1996), and Spender (2002) emphasize knowledge integration (KI) mechanisms by grounding their arguments upon management efficiency. Those that advocate the knowledge transfer (KT) approach highlight the benefit an organization obtains from replicating and sharing knowledge. Under knowledge integration considerations, knowledge has a specialized nature and is therefore difficult to share; to maximize specialized knowledge the firm needs to have a mechanism through which individual knowledge is exploited and combined to fulfil organizational tasks (e.g. Grant, 1996). Should knowledge be transferred or integrated? Whether knowledge transfer or integration alone leads to the creation of the firm's core competencies?

Having identified streams of knowledge underpinning the firm's core competencies, we, in this section, shall focus upon exploring knowledge management strategies for creating both collective tacit knowledge and integrated specialized knowledge. The intention is to develop a conceptual framework for developing the African firm's core competencies.

4.1. Creation of collective tacit knowledge

The means of facilitating the creation of collective tacit knowledge has been widely explored in the work of several writers (e.g. Argyris, 1994; Boisot, 1995; Crossan et al., 1999; Nonaka, 1994; Senge, 1990). Between them, Nonaka's (1994) SECI (Socialization, Externalization, Combination, Internalization) model, based on Polanyi's (1962) distinction between articulated and tacit knowledge and focused on its tacit dimension, is probably the most cited theoretical work on knowledge creation. He illustrates how to motivate knowledge creation through bold visions of products and strategies coupled with organizational cultures that promote sharing, transparency and proactive use of knowledge. In his model, knowledge is deemed to be transferable, and each transfer is defined as a specific process - individual tacit knowledge is shared through socialization process and made explicit through externalization process; explicit knowledge is then reconfigured and shared through combination process and converted into organizational tacit knowledge through internalization process. The organization continuously creates collective tacit knowledge by converting personal, tacit knowledge of individuals into shared explicit knowledge and embedding the latter into business practice. In these knowledge conversion and transfer processes, externalization and internalization processes are identified to be crucial, as both processes require high self-commitment important for self-transcendence, which was identified as a key determination of the knowledge creation process. The internalization of newly created knowledge is the conversion of explicit knowledge into the organization's tacit knowledge, which was identified as embedded collective know-how, part of organizational core competencies.

One important contribution of this theoretical framework is that it sees this knowledge transmission process as a dynamic knowledge creation spiral, in which new insights are constantly created by knowledge recipients and managed to sustain the firm's competitive advantage, as knowledge recipients are perceived to be creative rather than passive, so that, the

knowledge transfer process is not a one-way process. This is consistent with other scholars' arguments (e.g. Brown and Duguid, 2000; Clark, 1995).

The main constraint of this model, however, is that it is based on the assumption that all tacit knowledge can be eventually converted into explicit knowledge, hence, it ignores the notion that some specific tacit knowledge may be non-transferable (Hu, 1995; Winter, 1987) or the transferring process may not meet the firm's requirement for efficiency (Athanasios and Nigh, 2000; Demsetz, 1991; Grant, 1996; Spender, 2002). In addition, in business planning processes individuals often make sense of diffused explicit knowledge and directly create new individual tacit knowledge, especially specialized knowledge. In this case, diffused explicit knowledge is utilized and converted into individual tacit knowledge rather than embedded into collective tacit knowledge. This individual tacit knowledge often immediately contributes to corporate decisions through well-designed integrating systems to form the basis of corporate integrated knowledge (Li et al., 2016), the other part of organizational core competencies.

4.2. Creation of corporate integrated knowledge

A number of scholars (e.g. Demsetz, 1991; Dougherty, 1992; Eisenhardt, 1989; Grant, 1996; Hargadon and Sutton, 1997; Li et al., 2016) investigated the strategic means for facilitating specialized tacit knowledge integration. By questioning whether all types of personal tacit knowledge can be or are necessarily transferred into collective know-how, Grant (1996, p. 114) sheds light on the specialized nature of knowledge to argue that:

“transferring knowledge is not always an efficient approach to integrating knowledge.

If production requires the integration of many people's specialist knowledge, the key

to efficiency is to achieve effective integration while minimising knowledge transfer through cross learning by organizational members.”

In this context he pointed to four mechanisms for integrating specialized knowledge - rules and directives, sequencing, routines, group problem solving and decision-making. Rules and directives regulate the actions among specialists. Sequencing ensures that each specialist contributes independently in a pre-assigned time slot. Routines rely on an organizational business procedure system to reconcile complex patterns of individual behaviours and business interactions between specialists. Group problem solving and decision making provide a means by which specialized individuals coordinate to deal with complex problems and varied tasks. The smooth implementation of these mechanisms is contingent upon the existence of adequate common knowledge between specialists. Moreover, Grant and other researchers also extend this knowledge integration perspective beyond the firm boundaries. Kogut and Zander (1996), for example, emphasize the role of relational networks in integrating external knowledge with internal knowledge, and others (Hamel and Prahalad, 1989; Teece, 2000) have increasingly looked into strategic alliances as an important means to integrate valuable external knowledge.

Though there is a separation, even conflict, between the knowledge transfer approach and the knowledge integration perspective in the literature we postulate that they are not exclusive but complementary because neither alone creates all types of critical knowledge that underpin the firm’s core competencies.

To summarize these arguments:

Proposition 3 (P3). Knowledge transfer and integration techniques should be adopted systematically rather than separately in order to fully utilize the value of individual knowledge.

Based on these arguments in next section we merge the two separate perspectives and propose a unified knowledge management model that facilitates the creation of all streams of critical knowledge underpinning the firm's core competencies for African companies that hope to develop technological core capabilities.

5. A proposed model of knowledge management process for African companies

Fig. 1 depicts a strategic knowledge management model, in which the type of knowledge underpinning core competencies, as stated in Proposition 1 (P1), is clearly indicated and the processes through which African firms can gain core competencies are illustrated. The model reconciles the knowledge transfer (KT) approach, such as Nonaka's (2002) knowledge creation model, and Boisot's (1995) social learning curve, and knowledge integration perspective such as Demsetz's (1991) concept of knowledge integration and Grant's (1996) knowledge integration (KI) mechanism. It shows how KT and KI can be adopted systematically, as postulated in Proposition 3 (P3), during the ITT process between the technology developer (TD) of an industrial economy and the technology recipient (TR) in Africa. Compared to existing models it is distinctive because (1) it indicates the most valuable knowledge that underpins core competencies, which was unclear in existing studies (Eisenhardt and Santos, 2002), (2) it provides additional insights into the knowledge transfer-or-integration contradiction revealed by previous studies, and (3) it suggests a new knowledge creation process, sense-making, which stimulates a new circle of core competence creation.

Insert Fig. 1 about here

The model consists of seven management processes – codification, diffusion, articulation, internalization, sense-making, socialization, and integration. Core competencies are created following internalization, socialization, and integration processes, while new knowledge that stimulates new circles of core competence creation is developed in socialization and sense-making processes. We place the seven processes within a 2D-space, modified from Boisot's (1995) C-space. It consists of two dimensions: codification, the extent to which knowledge can be made explicit and recorded in a codified form, and diffusion, the extent to which knowledge is shared within a given population. Core competencies of the African firm, collective tacit knowledge and integrated specialized knowledge, are located at the left upper and lower corners respectively.

We now turn to explain each aspect of the model.

5.1. Codification

Codification refers to the transformation of knowledge from tacit into a codified format. It is a “people-to-documents” process (Hansen et al., 1999, p. 108). As we noted earlier, a certain proportion of technology on the technology spectrum is transferable and can be expressed on paper. Knowledge codification can be accomplished through encoded methodologies, such as encoding of tacit technological know-how of a technology source, e.g. a multinational company (MNC) of an industrial economy, in formulas, codes, expert systems, drawings and the like; expressing technology in natural language formats, such as reports, manuals, memos, patents and policies (Cacciatori et al., 2012; Zollo and Winter, 2002). Documenting a Q&A list for a new product developed over years is an example of this codification process. Another example is the writing up of a production plan based on years of shop floor management experience. In the codification process, the technology developer

transforms certain valuable technological know-how into accessible and easy-to-transfer forms for the technology recipient. Conventional ITT between industrial economies and LDCs is often limited to this process because it focuses on the trade of equipment and the transmission of codified technical information only (Maskus, 2003; Radošević, 1999).

For African firms, it is crucial to negotiate the best available terms for comprehensive international deals (e.g. the inclusion of sufficient codified technological know-how) that maximize the international transfer of relevant technologies. In FDI funded enterprises, the participation and training of technology recipient in encoding technologies is an essential measure taken by recipient firms to develop their own technical capability. By doing so, the recipient firm generates economic rent from the valuable tacit knowledge of the technology developer (Cowan et al., 2000; Fiedler and Welp, 2010). On the other hand, the recipient firm can avoid severe loss of knowledge during employee turnover in the host-country.

Knowledge codification in this framework is one of the KT processes and one of the necessary steps leading to the creation of ‘collective tacit knowledge’ (Nonaka, 1994; Schulz, 2008). Yet the codification process alone does not lead to the creation of such critical knowledge. As we stated in Proposition 2 (P2), technology transferred to recipient firms of LDCs (e.g. codified technical information) is often explicit in nature and, thus, does not constitute the technological core competencies of the recipient firm. Rather, codified knowledge is mobile and of limited value if it is not appropriated by relevant members of the recipient organization (Davenport and Prusak, 1998; Heimeriks et al., 2012). Therefore, a diffusion process within a given population in the technology recipient firm should be followed.

5.2. Diffusion

Codified knowledge can be disseminated into corporate explicit knowledge for public use within the technology recipient firm in Africa. We call such a process knowledge diffusion. The widespread use of filing systems, databases and internet communication in contemporary business facilitates this process (Dodgson et al., 2013; Vaccaro et al., 2009). Conventional ITT between industrial economies and LDCs engages little in the diffusion of codified technology in recipient firms due to significant technology distance between the technology source and the recipient (Evenson and Westphal, 1995). The technology recipient firm in Africa therefore needs to invest in information sharing systems or negotiate FDI projects that offer similar systems. The firm can also distribute hard-copy operational manuals and management handbooks across its operations (Levine and Prietula, 2012). Although diffused explicit knowledge is mobile in nature, it offers the opportunity for its wide application within a given population. This knowledge can be internalized to enhance the technology recipient's collective practice or used to make sense by their individuals for decision-making (Le Mens et al., 2011; Shropshire, 2010).

Like codification, knowledge diffusion in this framework is one of the KT processes and one of the necessary steps leading to the creation of collective tacit knowledge but it alone does not lead to the creation of such critical knowledge. To be of great value diffused knowledge needs to be exploited by members of the African firm through internalization and sense-making processes.

5.3. Articulation

Certain technological know-how on the technology spectrum may not be codifiable but can be expressed verbally to members of the technology recipient organization (Johnson et al., 2002; Peltokorpi et al., 2007). Articulation is a process through which such tacit knowledge is

enacted and transformed into articulated forms, and widely diffused within a given population of the technology recipient. It is one of the KT processes and another necessary step leading to the creation of collective tacit knowledge, but itself alone does not lead to the creation of such critical knowledge. Like diffused knowledge, to be of great value articulated knowledge needs to be exploited by members of the technology recipient firm through internalization and sense-making processes.

Articulation can be accomplished through collective discussions and debriefing sessions during ITT (Jian, 2011; Zollo and Winter, 2002). It is widely used in technological training and company meetings (Hong and Snell, 2013; Zhao and Anand, 2009). Compared to knowledge codification, knowledge articulation is a quicker way of externalizing tacit knowledge (Ernst and Kim, 2002). Knowledge can be disseminated effectively and very quickly to a larger population when individuals express their opinions and beliefs (Argyris, 1994; Kale and Singh, 2007). In this process, the technology developer verbally explains their technical knowledge to members of the technology recipient. However, knowledge articulation does not resist erosion of company memory (Lazaric et al., 2003). African companies therefore are suggested to adopt it in combination with knowledge codification.

However, it is important to note that company abilities to transform potentially articulatable knowledge into articulated statements vary (Winter, 1987; Cowan et al., 2000). It potentially requires significant efforts and commitment from members of the company (Nonaka, 1994). It also requires the development of mental models and the existence of a language and a social context in which knowledge can be articulated and understood (Ringberg and Reihlen, 2008).

5.4. Internalization

When members of the technology recipient firm put corporate explicit knowledge (diffused and articulated knowledge) into practical use they will gradually embed such knowledge into their business or routinized behaviour (Nelson and Winter, 1982; Vasudeva et al., 2013). We call this process knowledge internalization (Nonaka, 1994). KT is completed and collective tacit knowledge is created following this process. For example, shop floor workers can gain tacit understanding of how to implement a quality control system through using their production manual over time. This collective tacit knowledge secures the manufacturing of high quality products, which place the firm at the competitive edge. An example of such strength is Toyota's superior routine use of knowledge shared between its strategic alliances (Dyer and Nobeoka, 2000). Although such best practice is known by Toyota's rivals, they are not replicated because of the difficulties in doing so. As Nonaka (1994) argues, knowledge becomes a valuable asset when it is internalized to become shared mental models or technical know-how. Therefore, value is created when externalized knowledge is internalized. Unlike codification, diffusion and articulation, knowledge internalization directly leads to the creation of collective tacit knowledge.

Internalization bears similarities to the well-perceived notions of "collective learning" (Macpherson et al., 2010; Prahalad and Hamel, 1990) and "routine development" (Cacciatori, 2012; Zollo and Winter, 2002), which emphasize the relationship between "action" and "learning".

5.5. Sense-making

Corporate explicit knowledge (diffused and articulated knowledge) is often not only internalized into collective tacit know-how but also utilized by corporate members in business planning and problem solving processes (Le Mens et al., 2011). In the technology recipient

firm, actors can enact the ordinary routines of organizational life, make sense of diffused technology, and directly construct new knowledge (Orlikowski, 2010; Weick, 1995). Sense-making in this sense is a new knowledge creation (NKC) process. It is not just about interpreting a great volume and diversity of technical information (Weick, 1995). Rather, it is an innovation process through which organizational members create their own meaning that is relevant for a range of actions and commitments (Gioia and Chittipeddi, 1991; Patriotta, 2003). Novel ideas are created when organizational members relate newly diffused explicit knowledge to their own intellectual, social and historical contexts (Cornelissen, 2006; Ringberg and Reihlen, 2008; Whiteman and Cooper, 2011). This new knowledge can be enacted, codified and transferred into corporate knowledge when it is efficiently and economically transferable in the African firm.

However, very often, such new knowledge also directly contributes to corporate decisions (Pandza and Thorpe, 2009) through well-designed integrating systems to form the basis of corporate integrated knowledge, the other type of the firm's critical knowledge (see knowledge integration section for detailed reasoning). As Weick (1995) and Ringberg and Reihlen (2008) described, innovators make sense of new situations by looking back, drawing on their own and corporate memory to shape a new "landscape" of meanings that is sufficiently plausible to serve as a basis for joint action. This happens especially when organizations are faced with uncertainty (e.g. uncertainty in new applications of a type of technology) and the need to act under time constraints (Orlikowski, 2010). In doing so, they define emerging needs and determine whether they will maintain organizational continuity, shift to contingency plans, or instead engage in new forms of action (Pandza and Thorpe, 2009). Therefore, sense-making is also a KI process which is not adequately illuminated in existing knowledge-based frameworks.

5.6. Socialization

Some tacit knowledge (e.g. experience of implementing a new production process) is context-specific and difficult to formalize, thus, can only be acquired through shared experiences (Dyck et al., 2005; Tortoriello et al., 2012). Such a KT process can be called “socialization” (Michel, 2011; Nonaka, 1994). A corporate learning culture, for example, can be best acquired by new employees through day-to-day business interactions with other corporate members (Zander and Zander, 2010). Socialization therefore can be particularly used to transfer transferable yet difficult-to-formalize tacit knowledge into collective tacit knowledge (Li et al., 2016). Technicians of the technology recipient in Africa, for instance, can acquire certain technological know-how embedded in technical expatriates by spending time with them, which allows the recipients to master new technology eventually. Socialization is, therefore, another channel of transferring technological know-how and another process which directly leads to the creation of collective tacit knowledge.

However, it is important to note that learning through socialization is not a one-way process (Clark, 1995; Yang et al., 2008). New knowledge is often constructed in the course of socialized learning, which stimulates a new circle of critical knowledge creation (Nonaka, 1994). Hence, socialization is also a new knowledge creation (NKC) process.

5.7. Integration

Some specialized tacit knowledge on the knowledge spectrum takes considerable time to acquire or is non-transferable, yet is a key source of competitive advantage (Grant, 1996; Parmigiani and Mitchell, 2009; Spender, 1998). A typical example of such knowledge is a scientist’s vision for a new product developed through years of research experience. This is the

knowledge that can be identified yet unobservable and thus has been overlooked by scholars who favour the KT approach.

Drawing from Grant's (1996) KI perspective we argue that this knowledge can be utilized through wide-scale business co-operation and collaboration during ITT from the technology developer to the recipient in Africa, such as home- and host-country nationals' teamwork, collective decision-making, cross-functional taskforce, and strategic alliances (e.g. a joint venture project) of technology developers and recipients. Such collaboration provides a means by which specialized individuals coordinate to deal with complex problems and varied tasks (Li et al., 2016; Majchrzak et al., 2012; Srikanth and Puranam, 2011). The widespread adoption of teamwork in or across organizations underlines this understanding (Brusoni et al., 2001; Davis and Eisenhardt, 2011). Team members bring and apply different perspectives in order to solve context-specific problems or fulfil a business task that could not be done individually (Dougherty and Dunne, 2012; Hobday, 1998). In a fast-moving business world existing technology may soon become irrelevant to the business. Hence, KI can be more useful even for managing transferable knowledge because of its flexibility and speed (Sanchez and Mahoney, 1996).

KI is a different business process from KT which is accomplished through knowledge codification, articulation, diffusion, internalization and socialization in our framework. It does not require the movement of knowledge from one carrier to another. Yet it is not simply about putting diverse knowledge together. The process requires extensive interaction between technology developers and recipients which provides the context for the construction of new knowledge (Gavetti, 2005; Spender, 1998). If the KI process is implemented smoothly the resulting knowledge derived from it should be critical to the business's success (Bruns, 2013; Li et al., 2016). We therefore argue that KI entails integrating highly specialized knowledge of

the technology developer and recipient and constructing new knowledge which gives the technology recipient in Africa a competitive advantage.

Because it takes time to acquire and develop both collective tacit knowledge and integrated specialized knowledge it follows that firms that already possess a relevant set of these can gain competitive advantage over rivals (Grant, 1996).

Based on our key arguments developed from this model we propose that:

Proposition 4 (P4). The leading paths (LP) to the creation of core competencies for African technology recipient firms are internalization, socialization, and integration processes.

Proposition 5 (P5). New knowledge that stimulates new circles of core competence creation in African technology recipient firms is developed in socialization and sense-making processes.

6. Conclusion and implications

6.1. Theoretical implications

The theoretical contributions of this study are three fold. First, our analysis of core competencies and the proposed knowledge management process model enhance our understanding of knowledge-based strategizing for African companies. We argued that conventional ITT alone cannot create technological core competencies for African companies that seek to close the technological gap with firms of industrial economies. We explored this claim through examining the nature of technology transferable to LDCs. A primary premise of this central claim is that technology transferable to LDCs is largely explicit in nature and, thus,

does not constitute the technology recipient firm's core competencies (i.e. collective tacit knowledge and integrated specialised knowledge). Our conceptual model for constructing core competencies for African companies suggests the strategic means with which African firms can generate critical knowledge that underpins the firm's core competencies.

In the model, some tacit knowledge is codified, articulated, and diffused into corporate explicit knowledge base. Corporate data is then further embedded into corporate tacit knowledge base or utilized through sense-making by individuals to create new individual knowledge. Specialized tacit knowledge is integrated into corporate-level specialized tacit knowledge for fuller utilization. Core competencies for African firms are created through these particular knowledge management processes.

We have identified three leading paths (LP) to the creation of core competencies for African technology recipient firms – socialization, internalization, and integration. We have also identified two new knowledge creation (NKC) processes that stimulate new circles of core competence creation. Based on this model, we pinpoint that African companies should build their strategy on the creation of core competencies rather than solely relying on conventional ITT mechanisms.

Second, by examining the concept of core competency, and its roots in the resource-based view and knowledge-based perspective, we identified the most valuable knowledge that underpins core competencies, which was unclear in existing studies (Eisenhardt and Santos, 2002). We argued that the firm's core competencies rest on its collective tacit knowledge and integrated specialized knowledge. Based upon this argument, we proposed our knowledge management model in which the type of knowledge underpinning core competencies is clearly indicated and the processes through which firms can gain core competencies are illustrated.

Compared with preceding models (e.g. Boisot, 1995; Grant, 1996; Nonaka, 1994), our knowledge management model is distinctive because we established a theoretical link between

core competencies and knowledge management to further our understanding of knowledge-based view to the firm's strategy, which is also vague in the strategic management literature (Eisenhardt and Santos, 2002).

Finally, our conceptual model provided additional insights into the debate and contradiction revealed by previous studies (e.g. Grant, 1996; Nonaka, 1994) over the question of whether and how knowledge can be managed. We exploited the theoretical synergy of the two main conventional approaches, KT and KI. We argued that neither KT nor KI alone leads to the creation of all streams of core competencies. The essence of our argument is that core competencies that confer competitive advantage on the firm are a combination of collective tacit knowledge developed through KT processes, and integrated specialized knowledge derived from KI mechanisms; thus KT and KI techniques need to be adopted systematically rather than separately. We have shown how various types of knowledge on the knowledge spectrum can be managed to create the African firm's competitive advantage through complementary use of these two processes. This framework suggests that conventional knowledge-based approaches are limited and should give rise to a more integrative perspective on managing knowledge.

6.2. Limitations and future research

Although to some degree our framework should enrich our conceptual understanding of knowledge-based theories in general and strategies for African companies, its constraints provide anchors for future research. First, the framework does not consider any implementation problems the firm might encounter. However, it is important to note that operationalizing knowledge processes is difficult (Ambrosini and Bowman, 2001; Birkinshaw et al., 2002; Mudambi and Tallman, 2010). For example, Li and Scullion (2006) identified a number of

context-specific factors which constrained knowledge flow and utilization within international organizations. Spender (1996, 2002) pointed out that the knowledge-based view should not ignore the organizational and political context of knowledge management and the intervening processes such as information overload and cognitive inertia. Phelps et al. (2012) and von Krogh et al. (2012) found that prior work on knowledge processes does not devote much attention to context and cross-level analysis.

Similarly, Sillince (2005) commented that the social setting could determine what should be externalized. Inkpen (1998), by studying strategic alliances in America, suggested that knowledge valuation, searching knowledge connections between learning parties, relatedness of knowledge and cultural alignment between both sides are essential. Despite providing some useful insights in specific contexts whether these can be fully adopted in African cultural contexts is unclear. Management conditions differ significantly across cultures. This is an intriguing area which requires considerable attention but is beyond the scope of this article. The focus of our paper is on the various knowledge processes rather than the micro-level contextual factors that constitute the complexities and operational difficulties of building technological core competencies. Yet, to understand what facilitates KT and KI is crucial to exploiting technology as a potential source of wealth. It would be fruitful to further research the contextual factors that facilitate our proposed knowledge processes for African companies.

Second, the framework does not take account of the difficulties in measuring knowledge in firms. The challenges inherent in measuring the intangible are well-documented (King and Zeithaml, 2003; Peng, 2001; Phelps et al., 2012). The non-quantifiable nature of knowledge suggests difficulties for firms to implement their knowledge-based strategies (Li and Scullion, 2006). Although a couple of approaches are sought to tackle the problem, such as the use of archival proxies (Miller and Shamsie, 1996) and other observables that underlie

unobservables (Godfrey and Hill, 1995; Turner and Makhija, 2006), they are subject to “concerns about construct validity” (Barney et al., 2001, p. 636). Future scholars therefore are encouraged to undertake studies employing new methodologies or multiple approaches (Argote and Miron-Spektor, 2011; Easterby-Smith and Lyles, 2003; Hoskisson et al., 1999; Phelps et al., 2012). Barney and colleagues (2001), for example, suggest the conduct of qualitative studies of intangible assets to elicit a set of tangible indicators which are measurable. It would be useful to explore these possibilities and illuminate possible solutions in future research.

Nevertheless, our framework is among the first to reconcile diverse knowledge-based perspectives and propose knowledge-based strategic means for developing technological core competencies for African companies. We have shown how the contradictory mechanisms for handling different types of knowledge are complementary and can be adopted in combination to develop the African firm’s competitive advantage.

References

- Aaker, D. A. 1989. Managing assets and skills: The key to sustainable competitive advantage. *Cal. Manag. Rev.* 31 (2), 91-106.
- Aitken, B. J., Harrison, A. E. 1999. Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *Am. Econ. Rev.* 89 (3), 605-618.
- Archibugi, D., Pietrobelli, C. 2003. The Globalisation of technology and its implications for developing countries: Windows of opportunity or further burden? *Technol. Forecast. Soc.* 70 (9), 861-883.
- Almeida, P., Song, J., Grant, R. M. 2002. Are firms superior to alliances and markets? An empirical test of cross-border knowledge building. *Organ. Sci.* 13 (2), 147-161.
- Amankwah-Amoah, J. 2015. Solar energy in sub-Saharan Africa: The challenges and opportunities of technological leapfrogging. *Thunderbird Int. Bus. Rev.* 57 (1), 15-31.
- Amankwah-Amoah, J., Sarpong, D. 2016. Historical pathways to a green economy: The evolution and scaling-up of solar PV in Ghana, 1980-2010. *Technol. Forecast. Soc.* 102, 90–101.
- Ambrosini, V., Bowman, C. 2001. Tacit knowledge: some suggestions for operationalization. *J. Manag. Stud.* 38, 811-829.
- Amman, A., Cooper, J. 1982. *Industrial innovation in the Soviet Union*. Yale University Press, New Haven, CT.
- Argote, L., Miron-Spektor, E. 2011. Organizational learning: From experience to knowledge. *Organ. Sci.* 22, 1123-1137.
- Argyris, C. 1994. Good communication that blocks learning. *Harvard Bus. Rev.* 72 (4), 77-85.

- Arrow, J. 1962. The economic implications of learning by doing. *Rev. Econ. Stud.* 29 (3), 155–173.
- Athanassiou, N., Nigh, D. 2000. Internationalization, tacit knowledge and the top management teams of MNCs. *J. Int. Bus. Stud.* 31 (3), 471-487.
- Barney, J. B. 1986. Strategic factor markets: expectations, luck, and business strategy. *Manag. Sci.* 32, 1231-1241.
- Barney, J., Wright, M., Ketchen, D. 2001. The resource-based view of the firm: Ten years after 1991. *J. Manag.* 27, 625-642.
- Beamish, P. W. 1988. *Multinational joint ventures in developing countries*. Routledge, New York.
- Birkinshaw, J. M., Nobel, R., Ridderstråle, J. 2002. Knowledge as a contingency variable: Do the characteristics of knowledge predict organization structure? *Organ. Sci.* 13, 274-289.
- Blau, P., McHugh-Falbe, C., McKinley, W., Phelps, T. 1976. Technology and organization in manufacturing. *Admin. Sci. Q.* 21, 20-40.
- Boisot, M. H. 1995. Is your firm a creative destroyer? Competitive learning and knowledge flows in the technological strategies of firms. *Res. Policy* 24, 489-506.
- Borensztein, E., J., De Gregorio, J., Lee, W. 1998. How does foreign direct investment affect economic growth? *J. Int. Econ.* 45 (1), 115-135.
- Brown, J. S., Duguid, P. 2000. Balancing act: How to capture knowledge without killing it. *Harvard Bus. Rev.* 78 (3), 73-80.
- Brown, J. S., Duguid, P. 1998. Organizing knowledge. *Cal. Manag. Rev.* 40 (3), 90-111.
- Bruns, H. C. 2013. Working alone together: coordination in collaboration across domains of expertise. *Acad. Manag. J.* 56, 62-83.

- Brusoni, S., Prencipe, A., Pavitt, K. 2001. Knowledge specialization, organizational coupling, and the boundaries of the firm: why do firms know more than they make? *Admin. Sci. Q.* 46, 597-621.
- Buckley, P. J., Hashai, N. 2014. The role of technological catch up and domestic market growth in the genesis of emerging country based multinationals. *Res. Policy* 43 (2), 423-437.
- Cacciatori, E. 2012. Resolving conflict in problem-solving: systems of artefacts in the development of new routines. *J. Manag. Stud.* 49, 1559-1585.
- Cacciatori, E., Tamoschus, D., Grabher, G. 2012. Knowledge transfer across projects: Codification in creative, high-tech and engineering industries. *Manag. Learn.* 43, 309-331.
- Chen, E. K. Y. 1983. *Multinational corporations, technology and employment*. Macmillan, London.
- Clark, T. 1995. *Managing consultants: Consultancy as the management of impressions*. Open University Press, Buckingham.
- Collis, D. J., Montgomery, C. A. 1995. Competing on resources: Strategy in the 1990's. *Harvard bus. Rev.* 73 (4), 118-128.
- Cornelissen, J. P. 2006. Making sense of theory construction: metaphor and disciplined imagination. *Organ. Stud.* 27, 1579-1597.
- Contractor, F. 1980. The profitability of technology licensing by U. S. multinationals: A framework for analysis and empirical study. *J. Int. Bus. Stud.* 11, 40-63.
- Cowan, R., David, P. A., Foray, D. 2000. The explicit economics of knowledge codification and tacitness. *Ind. Corp. Change* 9, 211-253.
- Crossan, M. M., Lane, H. W., White, R. E. 1999. An organizational learning framework: From intuition to institution. *Acad. Manag. Rev.* 24 (3), 522-537.

- Cusumano, M.A., Elenkov, D., 1994. Linking international technology transfer with strategy and management: A literature commentary. *Res. Policy* 23, 195-215.
- Davenport, T. H., Prusak, D. E. 1998. *Working knowledge: How organizations manage what they know*. Harvard Business School Press, Boston, MA.
- Davis, J. P., Eisenhardt, K. M. 2011. Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Admin. Sci. Q.* 56, 159-201.
- Day, G. S. 1994. The capabilities of market-driven organisations. *J. Marketing* 58 (4), 37-53.
- Decarolis, D. M., Deeds, D. L. 1999. The impact of stocks and flows of organizational knowledge on firm performance: An empirical investigation of the biotechnology industry. *Strateg. Manag. J.* 20, 953-968.
- Demsetz, H. 1991. The theory of the firm revisited. In: Williamson, O. E., Winter, S. G. (Eds.), *The nature of the firm*. Oxford University Press, New York.
- Djankov, S., Hoekman, B. 2000. Foreign investment and productivity growth in Czech enterprises. *World Bank Econ. Rev.* 14 (1), 49 - 64.
- Dodgson, M., Gann, D. M., Phillips, N. 2013. Organizational learning and the technology of foolishness: The case of virtual worlds at IBM. *Organ. Sci.* 24, 1358-1376.
- Dosi, G. 1982. Technological paradigms and technological trajectories: A suggested interpretation of the determinants and directions of technical change. *Res. Policy* 11 (3), 147-162.
- Dougherty, D. 1992. Interpretive barriers to successful product innovation in large firms. *Organ. Sci.* 3 (2), 179-202.
- Dougherty, D., Dunne, D. 2012. Digital science and knowledge boundaries in complex innovation. *Organ. Sci.* 23, 1467-1484.

- Dyck, B., Starke, F. A., Mischke, G. A., Mauws, M. 2005. Learning to build a car: An empirical investigation of organizational learning. *J. Manag. Stud.* 42, 387-416.
- Dyer, J. H., Nobeoka, K. 2000. Creating and management a high-performance knowledge-sharing network: The Toyota case. *Strateg. Manag. J.* 21, 345-367.
- Easterby-Smith, M., Lyles, M., 2003. Organizational learning and knowledge management: Agendas for future research. In: Easterby-Smith, M., Lyles, M. (Eds.), *The Blackwell handbook of organizational learning and knowledge management*. Blackwell, Oxford.
- Eisenhardt, K. M. 1989. Making fast strategic decisions in high-velocity environments. *Acad. Manag. J.* 32 (3), 543-576.
- Eisenhardt, K. M., Santos, F. M. 2002. Knowledge-based view: A new theory of strategy? In: Pettigrew, A., Thomas, H., Whittington, R. (Eds.), *Handbook of strategy and management*. Sage, London.
- Ernst, D., Kim, L. 2002. Global production networks, knowledge diffusion, and local capability formation. *Res. Policy*, 31 (8), 1417-1429.
- Evenson, R. E., Westphal, L. E. 1995. Technological change and technology strategy. In: Behrman, J., Srinivasan, T. N. (eds.), *Handbook of development economics*. Elsevier Science, Amsterdam.
- Fiedler, M., Welp, I. 2010. How do organizations remember? The influence of organizational structure on organizational memory. *Organ. Stud.* 31, 381-407.
- Foss, N., Knudsen, C. 1996. *Towards a competence theory of the firm: Studies in business organization and networks*. Routledge, New York.
- Gavetti, G. 2005. Cognition and hierarchy: Rethinking the microfoundations of capabilities' development. *Organ. Sci.* 16, 599-617.
- Gioia, D. A., Chittipeddi, K. 1991. Sense-making and sensegiving in strategic change initiation. *Strateg. Manag. J.* 12, 433-448.

- Glass, A. J., Saggi, K., 1998. International technology transfer and the technology gap. *J. Dev. Econ.* 55, 369–398.
- Godfrey, P. C., Hill, C. W. 1995. The problem of unobservables in strategic management research. *Strateg. Manag. J.* 16, 519-533.
- Grant, R. M. 1991. The resource-based theory of competitive advantage: Implications for strategy formulation. *Cal. Manag. Rev.* 33 (3), 114-135.
- Grant, R. M. 1996. Toward a knowledge-based theory of the firm. *Strateg. Manag. J.* 17, 109-22.
- Grant, E. B., Gregory, M. J. 1997. Tacit knowledge, the life cycle and international manufacturing transfer. *Technol. Anal. Strateg.* 9 (2), 149-161.
- Griffith, T., Sawyer, J., Neale, M. 2003. Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals, and information technology. *MIS Quart.* 27, 265-287.
- Grosse, R. (1996). International technology transfer in services. *J. Int. Bus. Stud.* 27, 781–800.
- Hall, R. 1992. The strategic analysis of intangible resources. *Strateg. Manag. J.* 13, 135-144.
- Hamel, G., Prahalad, C. K. 1989. Collaborate with your competitors and win. *Harvard Bus. Rev.* 67 (1), 133-139.
- Hansen, M. T., Nohria, N., Tierney, T. 1999. What's your strategy for managing knowledge. *Harvard Bus Rev.* 77 (2), 106-116.
- Hargadon, A., Sutton, R. I. 1997. Technology brokering and innovation in a product development firm. *Admin. Sci. Q.* 42, 716-749.
- Heimeriks, K. H., Schijven, M., Gates, S. 2012. Manifestations of higher-order routines: The underlying mechanisms of deliberate learning in the context of postacquisition integration. *Acad. Manag. J.* 55, 703-726.

- Hill, M. R., Hay, C. M. 1993. Trade, industrial co-operation and technology transfer: Continuity and change in a new era of East-West relations. Avebury, Brookfield, Vt.
- Hobday, M. 1995. East Asian latecomer firms: Learning the technology of electronics. *World Dev.* 23 (7), 1171-1193.
- Hobday, M. 1998. Product complexity, innovation and industrial organization. *Res. Policy* 26, 689-710.
- Hong, J., Snell, R. 2013. Developing new capabilities across a supplier network through boundary crossing: A case study of China-based MNC subsidiary its local suppliers. *Org. Stud.* 34, 377-406.
- Hoskisson, R. E., Hitt, M. A., Wan, W. P., Yiu, D. 1999. Theory and research in strategic management: Swings of a pendulum. *J. Manag.* 25, 417-456.
- Hu, Y. S. 1995. The international transferability of the firm's advantages. *Cal. Manag. Rev.* 37, 78-88.
- Inkpen, A. C. 1998. Learning and knowledge acquisition through international strategic alliances. *Acad. Manag. Exec.* 12 (4), 69-80.
- Jewkes, J., Sawers, D., Stillerman, R. 1958. The sources of invention. Macmillan, London.
- Jian, G. 2011. Articulating circumstance, identity and practice: Toward a discursive framework of organizational changing. *Organization* 18, 45-64.
- Jiang, J., Tao, T., Santoro, M. D. 2010. Alliance portfolio diversity and firm performance. *Strateg. Manag. J.* 31, 1136-1144.
- Johnson, B., Lorenz, E., Lundvall, B-A. 2002. Why all this fuss about codified and tacit knowledge? *Ind. Corp. Change.* 11, 245-262.
- Oliveira Jr., M. M., Child, J. 1999. Knowledge sharing in multinational advertising companies: Empirical findings from a case study in three countries. 19th Annual International Strategic Management Society Conference, Berlin.

- Kale, P., Singh, H. 2007. Building firm capabilities through learning: The role of the alliance learning process in alliance capability and firm-level alliance success. *Strateg. Manag. J.* 28, 981-1000.
- Keller, W. 2002. Geographic Localization of International Technology Diffusion. *Am. Econ. Rev.* 92, 120-142.
- Keller, W. 2004. International technology diffusion. *J. Econ. Lit.* 42 (3), 752-782.
- Kim, L. 1997. Imitation to innovation: The dynamics of Korea's technological learning. Harvard Business School Press, Boston.
- King, A. W., Zeithaml, C. P. 2003. Measuring organizational knowledge: A conceptual and methodological framework. *Strateg. Manag. J.* 24, 763–772.
- Kogut, B. 1991. Country capabilities and the permeability of borders. *Strateg. Manag. J.* 12, 33-47.
- Kogut, B., Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Org. Sci.* 3 (3), 383-397.
- Kogut, B., Zander, U. 1996. What firms do? Coordination, identity, and learning. *Org. Sci.* 7 (5), 502-523.
- Kotha, R., George, G., Srikanth, K. 2013. Bridging the mutual knowledge gap: coordination and the commercialization of university science. *Acad. Manag. J.* 56, 498-524.
- Lazarcic, N., Mangolte, P. A., Massué, M. L. 2003. Articulation and codification of collective know-how in the steel industry: Evidence from blast furnace control in France. *Res. Policy* 32, 1829–1847.
- Lei, D., Hitt, M. A., Bettis, R. 1996. Dynamic core competencies through meta-learning and strategic context. *J. Manag.* 22 (4), 549-569.
- Le Mens, G., Hannan, M. T., Pólos, L. 2011. Founding conditions, learning, and organizational life chances: Age dependence revisited. *Admin. Sci. Q.* 56, 95-126.

- Leonard-Barton, D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strateg. Manag. J.* 13, 111-125.
- Leonard-Barton, D., Sensiper, S. 1998. The role of tacit knowledge in group innovation. *Cal. Manag. Rev.* 40 (3), 112-132.
- Levine, S. S., Prietula, M. J. 2012. How knowledge transfer impacts performance: A multilevel model of benefits and liabilities. *Org. Sci.* 23, 1748-1766.
- Li, S., Scullion, H. 2006. Bridging the distance: managing cross-border knowledge holders. *Asia Pac. J. Manag.* 23, 71-92.
- Li, S., Easterby-Smith, M., Lyles, M., Clark, T. 2016. Tapping the power of local knowledge: A local-global interactive perspective. *J. World Bus.* 51 (4), 641–653.
- Liu, Z. 2002. Foreign direct investment and technology spillover: Evidence from China. *J. Comparative Econ.* 30 (3), 579-602.
- Macpherson, A., Kofinas, A., Jones O., Thorpe, R. 2010. Making sense of mediated learning: Cases from small firms. *Manag. Learn.* 41, 303-323.
- Madhok, A. 2006. Revisiting multinational firms' tolerance for joint ventures: A trust-based approach. *J. Int. Bus. Stud.* 37, 30-43.
- Makino, S., Delios, A. 1996. Local knowledge transfer and performance: Implications for alliance formation in Asia. *J. Int. Bus. Stud.* 27 (5), 905-928.
- Majchrzak, A., More, P. H. B., Faraj, S. 2012. Transcending knowledge differences in cross-functional teams. *Org. Sci.* 23, 951-970.
- Maskus, K. E. 2003. Encouraging international technology transfer. UNCTAD/ICTSD, Geneva.
- March, J. G. 1991. Exploration and exploitation in organizational learning. *Organ. Sci.* 2 (2), 71-87.

- March, J. G., Simon, H. A. 1958. *Organizations*. John Wiley and Sons, New York.
- Marino, K. 1996. Developing consensus on firm competencies and capabilities. *Acad. Manag. Exec.* 10 (3), 40-52.
- McEvily, S. K., Chakravarthy, B. 2002. The persistence of knowledge-based advantage: An empirical test for product performance and technological knowledge. *Strateg. Manag. J.* 23 (4), 285-305.
- Meyer, M. H., J. M. Utterback. 1993. The product family and the dynamics of core capability. *Sloan Manage. Rev.* 34 (3), 29-47.
- Michel, A. 2011. Transcending socialization: A nine-year ethnography of the body's role in organizational control and knowledge workers' transformation. *Admin. Sci. Q.* 56, 325-368.
- Miller, D., Shamsie, J. 1996. The resource-based view of the firm in two environments: The Hollywood film studios from 1936 to 1965. *Acad. Manag. J.* 39, 519-543.
- Mowery, D.C., Rosenberg, N., 1989. *Technology and the pursuit of economic growth*. Cambridge Univ. Press, New York.
- Mudambi, S. M., Tallman, S. 2010. Make, buy or ally? Theoretical perspectives on knowledge process outsourcing through alliances. *J. Manag. Stud.* 47, 1434–1456.
- Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Org. Sci.* 5 (1), 14-37.
- Orlikowski, W. J. 1992. The duality of technology: Rethinking the concept of technology in organizations. *Org. Sci.* 3 (3), 398-427.
- Orlikowski, W. J. 2010. The sociomateriality of organisational life: Considering technology in management research. *Cambridge J. Econ.* 34, 125-141.

- Osabutey, E. L. C. Debrah, Y. A. 2012. Foreign direct investment and technology and knowledge transfer policies in Africa: A review of the Ghanaian experience. *Thunderbird Int. Bus. Rev.* 54 (4), 441-456.
- Osabutey, E. L. C. Jin, Z. 2016. Factors influencing technology and knowledge transfer: configurational recipes for Sub-Saharan Africa. *J. Bus. Res.* 69, 5390–5395.
- Osabutey, E. L. C., Williams, K., Debrah, Y. A. 2014. The potential for technology and knowledge transfers between foreign and local firms: A study of the construction industry in Ghana. *J. World Bus.* 49 (4), 560-571.
- Pandza, K., Thorpe, R. 2009. Creative search and strategic sense-making: Missing dimensions in the concept of dynamic capabilities. *Br. J. Manag.* 20, S118–S131.
- Parmigiani, A., Mitchell, W. 2009. Complementarity, capabilities, and the boundaries of the firm: The impact of within-firm and interfirm expertise on concurrent sourcing of complementary components. *Strateg. Manag. J.* 30, 1065-1091.
- Patel, P., Pavitt, K. 1994. Uneven (and divergent) technological development amongst advanced countries: Evidence and a framework of explanation. *Ind. Corp. Change* 13, 759-787
- Patriotta, G. 2003. Sensemaking on the shop floor: Narratives of knowledge in organizations. *J. Manag. Stud.* 40, 349-375.
- Peng, M. 2001. The resource-based view and international business. *J. Manag.* 6, 803-829.
- Peltokorpi, V., Nonaka, I., Kodama, M. 2007. NTT DoCoMo's launch of I-Mode in the Japanese mobile phone market: A knowledge creation perspective. *J. Manag. Stud.* 44, 50–72.
- Perrow, C. 1967. A framework for the comparative analysis of organizations. *Am. Sociol. Rev.* 32, 194-208.

- Phelps, C. C., Heidl, R., Wadhwa, A. 2012. Networks, knowledge, and knowledge networks: A critical review and research agenda. *J. Manag.* 38, 1115-1166.
- Polanyi, M. 1958. *Personal knowledge: Towards a post-critical philosophy*. Routledge and Kegan Paul, London.
- Prahalad, C. K., Hamel, G. 1990. The core competence of the corporation. *Harvard Bus. Rev.* 68 (3), 79-91.
- Radosevic, S. 1999. *International technology transfer and catch-up in economic development*. Edward Elgar, UK.
- Ringberg, T., Reihlen, M. 2008. Towards a socio-cognitive approach to knowledge transfer. *J. Manag. Stud.* 45, 913-935.
- Romer, P. 1993. Idea gaps and object gaps in economic development. *J. Monetary Econ.* 32 (3), 543-573.
- Rosenberg, N., 1982. *Inside the black box: Technology and economics*. Cambridge University Press, Cambridge.
- Sanchez, R., Mahoney, J. T. 1996. Modularity, flexibility, and knowledge management in product and organization design. *Strateg. Manag. J.* 17, 63-76.
- Schulz, K.-P. 2008. Shared knowledge and understandings in organizations: Its development and impact in organizational learning processes. *Manage. Learn.* 39, 457-473.
- Senge, P. 1990. *The fifth discipline: The art and practice of the learning organisation*. Doubleday, New York.
- Shropshire, C. 2010. The role of the interlocking director and board receptivity in the diffusion of practices. *Acad. Manag. Rev.* 35, 246-264.
- Sillince, J. A. A. 2005. A contingency theory of rhetorical congruence. *Acad. Manag. Rev.* 30, 608-621.

- Solow, R. M. 1957. Technical change and the aggregate production function. *Rev. Econ. Stat.* 39 (3), 312-320.
- Spender, J. –C. 1998. Pluralist epistemology and the knowledge-based theory of the firm. *Org.* 5 (2), 233-256.
- Srikanth, K., Puranam, P. 2011. Integrating distributed work: comparing task design, communication, and tacit coordination mechanisms. *Strateg. Manag. J.* 32, 849-875.
- Stalk, G., Evans, P., Shulman, L. E. 1992. Competing on capabilities: The new rules of corporate strategy. *Harvard Bus. Rev.* 70 (2), 57-69.
- Tampoe, M. 1994. Exploiting the core competences of your organization. *Long Range Plann.* 27 (4), 66-77.
- Teece, D. J. 2000. Strategies for managing knowledge assets: The role of firm structure and industrial context. *Long Range Plann.* 33, 35-54.
- Thompson, J. D. (1967) *Organizations in Action*, New York: McGraw-Hill.
- Tortoriello, M., Reagans, R., McEvily, B. 2012. Bridging the knowledge gap: The influence of strong ties, network cohesion, and network range on the transfer of knowledge between organizational units. *Org. Sci.* 23, 1024-1039.
- Turner, K. L., Makhija, M. V. 2006. The role of organizational controls in managing knowledge. *Acad. Manag. Rev.* 31, 197-217.
- van Pottelsberghe de la Potterie, B., Lichtenberg, F. 2001. Does foreign direct investment transfer technology across borders? *Rev. Econ. Stat.* 83 (3), 490-497.
- Vaccaro, A., Veloso, F., Brusoni, S. 2009. The impact of virtual technologies on knowledge-based processes: An empirical study. *Res. Policy* 38, 1278–1287.
- Vasudeva, G., Zaheer, A., Hernandez, E. 2013. The embeddedness of networks: Institutions, structural holes, and innovativeness in the fuel cell industry. *Org. Sci.* 24, 645-663.

- von Krogh, G., Ichijo, K., Nonaka, I. 2000. Enabling knowledge creation: How to unlock the mystery of tacit knowledge and unleash the power of innovation. Oxford University Press, New York.
- von Krogh, G., Nonaka, I., Rechsteiner, L. 2012. Leadership in organizational knowledge creation: a review and framework. *J. Manag. Stud.* 49, 240-277.
- von Hippel, E. 1994. Sticky information and the locus of problem solving. *Manag. Sci.* 40 (4), 429-439.
- Weick, K. E. 1995. Sensemaking in Organizations. Thousand Oaks, CA: Sage.
- Westphal, L. E., Kim, L., Dahlman, C. J. 1985. Reflections on the Republic of Korea's acquisition of technological capability. In: Rosenberg, N., Frischtak, C. (Eds.), International technology transfer: Concepts, measures, and comparisons. Praeger Publishers, New York.
- Xu, B. 2000. Multinational enterprises, technology diffusion, and host country productivity growth. *J. Dev. Econ.* 62 (2), 477-493.
- Whiteman, G., Cooper, W. H. 2011. Ecological sensemaking. *Acad. Manag. J.* 54, 889-911.
- Winter, S. G. 1987. Knowledge and competence as strategic assets. In: Teece, D. J. (Ed.), The competitive challenge: Strategies for industrial innovation and renewal. Ballinger, Cambridge, MA.
- Woodward, J. 1958. Management and Technology. H.M.S.O., London.
- Yang, Q., Mudambi, R., Meyer, K. E. 2008. Conventional and reverse knowledge flows in multinational corporations. *J. Manag.* 34, 882-902.
- Zander, U., Zander, L. 2010. Opening the grey box: Social communities, knowledge and culture in acquisitions. *J. Int. Bus. Stud.* 41, 27-37.
- Zhao, Z., Anand, J. 2009. A multilevel perspective of knowledge transfer: Evidence from the Chinese automotive industry. *Strateg. Manag. J.* 30, 959-983.

Zollo, M., Winter, S. G. 2002. Deliberate learning and the evolution of dynamic capabilities.
Org. Sci. 13, 339-351.

Fig. 1. A strategic knowledge management model for African companies

